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THIRD-YEAR RESULTS IN THE DENVER-STANFORD PROJECT, REPORT NUMBER 3--RESEARCH ON THE CONTEXT OF INSTRUCTIONAL TELEVISION.

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THE DENVER PUBLIC SCHOOLS AND STANFORD UNIVERSITY'S INSTITUTE FOR COMMUNICATION RESEARCH, IN A JOINT RESEARCH PROJECT, INVESTIGATED AN AUDIOLINGUAL METHOD TO TEACH SPANISH TO FIFTH AND SIXTH GRADERS. RESULTS AT THE FIFTH-GRADE LEVEL SUGGESTED THAT ELECTRONIC AIDS, ESPECIALLY THOSE WITH FEEDBACK (THAT IS, WHERE THE CHILD RECORDS AND LISTENS TO HIS OWN VOICE), ARE A DESIRABLE ADDITION TO THE CLASSROOM SPANISH PROGRAM. AN EXCEPTION TO THIS OCCURS, FOR REASONS SO FAR UNEXPLAINED, AMONG CHILDREN FROM HOMES WHERE SPANISH IS SPOKEN NATIVELY. THESE CHILDREN ARE VERY FEW IN NUMBER, HOWEVER, SO THAT THE ELECTRONIC AIDS APPEAR POTENTIALLY HELPFUL TO THE GREAT MAJORITY OF FIFTH-GRADE PUPILS. THE SIXTH-GRADE RESULTS CONFIRMED A PREVIOUSLY STATED HYPOTHESIS THAT A COMBINATION OF AUTOMATED AND TEACHER-DIRECTED READING AND WRITING INSTRUCTION WOULD BE SUPERIOR TO EITHER METHOD ALONE. THE COMBINATION PRODUCED SIGNIFICANTLY SUPERIOR RESULTS ON BOTH LISTENING COMPREHENSION AND READING AND WRITING TESTS. SPEAKING TEST RESULTS SHOWED THE COMBINATION SLIGHTLY LESS FAVORABLE, APPARENTLY BECAUSE OF LESS FACE-TO-FACE CONTACT BETWEEN PUPIL AND TEACHER WHEN AUTOMATED INSTRUCTION IS USED. IT APPEARS, HOWEVER, THAT THIS DEFICIENCY CAN BE OVERCOME THROUGH USE OF ELECTRONIC AIDS OUTSIDE OF THE REGULAR SPANISH INSTRUCTION PERIOD. OTHER REPORTS IN THIS SERIES ARE ED 003 244 AND ED 003 245. (LP)

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THIRD YEAR RESULTS IN THE DENVER-STANFORD PROJECT

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Denver Public Schools • Stanford University

RESEARCH ON THE CONTEXT OF INSTRUCTIONAL TELEVISION

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THIRD YEAR RESULTS
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James T. Johnson, Jr.

DENVER-STANFORD PROJECT
ON THE CONTEXT OF INSTRUCTIONAL TELEVISION

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School District Number One
City and County of Denver
Denver, Colorado

Institute for Communication Research
Stanford University
Stanford, California

Report Number 10
March 1964

SUMMARY

The Problem

During 1962-63, the last year of active research in the Denver-Stanford Project, work was continued at both the fifth and sixth grades. As in previous years, fifth grade instruction was concerned entirely with the development of listening and speaking skills--that is, it was entirely audio-lingual in nature. Audio-lingual instruction was continued at sixth grade, and, in addition, development of reading and writing skills was begun.

The research at fifth grade was designed to determine, first, the value of certain electronic aids and, second, the most useful ways to incorporate these aids into the instructional process. Some children used no electronic aids. Some listened and responded to special lessons on record players and tape recorders but did not record their own voices. Still others both listened and recorded their own voices.

At sixth grade, the research was directed mainly toward evaluating methods of teaching reading and writing. Reading and writing was taught entirely by the traditional teacher-directed method, entirely by the automated method (programed instruction) and by various combinations of these two methods. Other activities included extended reading of simple Spanish materials and use of a "Spanish Corner," in which was placed reading materials, electronic aids, and cultural artifacts.

Finally, parent participation in the instructional process was continued at both fifth and sixth grades.

Results

Results at fifth grade suggested that electronic aids, especially those with feedback (that is, where the child records and listens to his own voice), are a desirable addition to the classroom Spanish program. An exception to this occurs, for reasons so far unexplained, among children from homes where Spanish is spoken natively. These children are very few in number, however, so that the electronic aids appear potentially helpful to the great majority of fifth grade pupils.

The sixth grade results confirmed a previously stated hypothesis that a combination of automated and teacher-directed reading and writing instruction would be superior to either method alone. The combination produced significantly superior results on both listening comprehension and reading and writing tests. Speaking test results showed the combination slightly less favorable, apparently because of less face-to-face contact between pupil and teacher when automated instruction is used. It appears, however, that this difficiency can be overcome through use of electronic aids outside of the regular Spanish instruction period.

Special interest scales were used at sixth grade, and they showed that both teacher and pupil interest affect learning. Pupil interest related, as a dependent variable, to two factors. The stronger was pupil interest prior to the beginning of the school year, emphasizing the importance of the pupil's experience at fifth grade. The second factor was experimental treatment; pupil interest was higher under the conditions which provided some activity in addition to those of the regularly scheduled classroom period. Homework was one such additional activity. Teacher interest was found to interact with teacher experience and preparation in a most revealing manner. Where teacher interest was high, pupil performance was directly related to teacher preparation and experience. But, where teacher interest was low, pupil performance was inversely related to teacher preparation and experience.

Class size was considered and smaller classes proved advantageous only in those situations involving direct teacher instruction.

Overall, the third year results reemphasized the importance of the classroom teacher, even when the basic instruction is handled through television as in this project. A well trained and highly motivated classroom teacher is undoubtedly the most effective single "learning aid" that a school system can combine with instructional television.

Finally, parent participation again proved a valuable addition to the instructional package at both fifth and sixth grades. Pupils whose parents worked with them learned significantly more Spanish than those whose parents did not participate.

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THIRD YEAR RESULTS
IN THE DENVER-STANFORD PROJECT

by

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The Denver Public Schools and Stanford University's Institute for Communication Research are currently engaged in a joint research project on the context of instructional television. The purpose of the project is to learn how instructional television can best fit into the total teaching situation. A substantial amount of research has established that television is a very effective teaching medium. Ways of combining it with other educational activities must now be considered, and the Denver-Stanford project is a beginning effort in this direction. Kenneth E. Oberholtzer is principal investigator for the Denver Public Schools and Wilbur Schramm is principal investigator for Stanford University. This is one of a number of project progress reports.

I. BACKGROUND

The Denver-Stanford Project on the Context of Instructional Television has been concerned with teaching Spanish to fifth and sixth grade pupils in the Denver Public Schools, and has used television as the basic instructional medium. The project has involved a search for school and home activities which, as additions to the television instruction, would increase the amount of Spanish learned by pupils.

Research in the project was conducted over three full school years, beginning with 1960-61. This report deals with results obtained during the last of those years, the 1962-63 school year. Other findings, plus an extensive discussion of the project's background, have been treated in previous reports (1, 2, 3, 4), and these items will be repeated here only as they apply to the research in 1962-63.

A knowledge of the general hypotheses to be tested in the project is necessary to understand the third year design. These hypotheses, as originally stated, were:

1. Instructional television of a certain kind, reinforced by certain classroom activities, makes for more learning, ceteris paribus, than without this reinforcement.
2. Instructional television of a certain kind, reinforced by certain home activities, makes for more learning, ceteris paribus, than without this reinforcement.
3. Instructional television of a certain kind, reinforced by certain home and classroom activities, makes for more learning, ceteris paribus, than without these reinforcements or with either one alone.
4. Certain kinds of instructional television, combined with certain kinds of home and classroom reinforcements, make for more learning, ceteris paribus, than other kinds and combinations.

Previous reports have shown hypotheses one, two, and three to be completely verified. The research in 1962-63, therefore, was concerned with hypothesis four -- with the systematic variation of different combinations of home and classroom activities to discover that combination which, when used in conjunction with instructional television, would best meet the objectives of an elementary school foreign language program.

Most of the individual activities investigated in 1962-63 had been tried as single practices before, and in this sense the research was repetitive. The combinations of activities were original in large part, however, and a few practices were entirely new. Thus the research design in 1962-63 was both repetitive and original; it represented a building on previous experience and findings, while, at the same time, it allowed the investigation of new ideas.

The research design and analysis of results were also based, in part, on previous experience. In the project generally, outside influences on a child's performance (that is, independent of the child's own ability, his previous learning, etc.) have fallen into three distinct and mutually exclusive (though interacting) sets of variables; and some attempt has been made to take each of these sets into account. The sets may be termed (1) method variables, (2) teacher variables, and (3) home variables, and are defined as follows:

1. Method variables consist of those practices and activities devised to directly affect learning and produce a specific result. Included are the television presentation; the face-to-face instruction by the classroom teacher; the use of tape recorders, record players, and automated materials; certain specifically designated homework; and the like. These are the variables most easily manipulable and, therefore, most easily evaluated through experimental design.
2. Teacher variables consist of personal characteristics of the classroom teacher, and they affect, among other things, the efficacy of many method variables. Teaching variables include the teacher's interest in the subject matter and in new teaching techniques, the number of courses in foreign language, his professional experience, his ability to achieve rapport with his pupils, etc. Many of these variables are extremely difficult to evaluate, though some of them have been approached through survey techniques.
3. Home variables, of great importance because they determine in large part the child's interests and attitudes, are directly related to parental characteristics. Included are the extent of the parents' education, their interest in the specific subject matter at hand, their willingness to work with the child, the standards of performance they establish, etc. Some of these variables have also been approached through survey techniques.

II. ACTIVITIES AND RESULTS AT FIFTH GRADE

A. Research Design

Experimental Procedures. Fifth grade is the first year in which pupils have foreign language instruction in Denver. In accord with FLES (Foreign Language in the Elementary School) recommendations, the first year's instruction is entirely audio-lingual. That is, the first year's instruction is devoted entirely to the development of understanding and speaking skills. Development of the other language skills, reading and writing, begins at sixth grade.

The basic element of the audio-lingual instruction at fifth grade was a 15-minute television program, seen every Monday, Wednesday, and Friday from 12:45 to 1:00 p.m. by each pupil. The television experience was therefore the same for everyone. In fact, this television experience was standard throughout the three years of research; the lessons were developed and recorded on videotape prior to use in 1960-61 and were repeated each year thereafter (5).

A second common element was a 15-minute follow-up to the television lesson. This follow-up was conducted by the classroom teacher through an eclectic approach which utilized structure drill, pattern drill, and a variety of other activities.

The research groups at fifth grade, therefore, differed according to those activities which were added to in-school television viewing and teacher-directed eclectic practice. These additional activities were directed toward evaluating and learning more effective uses of certain electronic aids in the classroom. More specifically, the aids consisted of record players and tape recorders which allowed a child to hear Spanish spoken by a native speaker and, in some cases, record his own voice and hear it played back.

Three groups were set up according to this scheme:

1. No electronic aids. Children in this group had only the common elements of TV viewing and eclectic practice. They served primarily as a control group, or in other words as a base against which to compare the performance of other pupils.
2. Electronic aids without feedback. Children in this group had, in addition to TV viewing and eclectic practice, record players or in a few cases tape recorders. This group did not record their own voices. Rather, they listened to specially-prepared lesson segments.
3. Electronic aids with feedback. Children in this group had, in addition to the common activties, tape recorders which were used to record and play back their own voices. They also made use of special lesson segments.

Electronic aids without feedback, with record players only, were tried in 1961-62; therefore, the first two groups in the 1962-63 design constituted an exact replication. This part of the design was replicated because the earlier results failed to provide clear-cut conclusions. Overall, there was no significant difference in overall performance between those who had record players and those who did not, though some specific classes seemed to profit by using them (2). Further investigation led to the suggestion that teachers had not been sufficiently informed as to how the aids should be used. Therefore, in 1962-63 a set of suggested uses of the aids with each lesson was prepared by language experts and distributed to the appropriate teachers. In addition, these teachers attended special training sessions devoted to the electronic aids.

The feedback condition of the third research group had not been tried previously and was thus original in 1962-63. The idea behind feedback is that a pupil can better understand and correct his mistakes in pronunciation when he hears himself speak, especially if he can compare his own performance to that of an expert. Thus, in addition to the opportunity for varied, directed practice in listening and speaking provided under the no-feedback condition, the pupil has further help in pronunciation.

All practice with electronic aids occurred in the classroom. The most immediate reason for this was that no elementary schools in the Denver system had language laboratories. In any case, however, it would seem desirable to keep the electronic aids in the classroom the first year of instruction because of the closer control allowed the classroom teacher. Fernand Marty has commented as follows on the need for close teacher supervision in the beginning year:

> ...the most favorable situation for improvements in pronunciation is when the teacher, the student, and the machine work jointly. The teacher guides the student, he tells him whether he is getting closer to correct pronunciation . . . . (Without the active help of the teacher) the student is generally unable to determine by himself the causes (of his incorrect pronunciation) (6).

In addition to the above three experimental conditions, the research design provided for parent participation. For the third year, parents were given the opportunity to volunteer to help their children in Spanish.

As before, parent participants were asked to view a repeat of the TV lesson in the evening with their children, to use a special guide book which suggested various home activities, and to use phonograph records which were provided to improve listening and speaking skills. (For a more complete discussion of the home activities, see references 4 and 7.)

Thus each child was classified in the design in two ways -- according to his primary research group and according to whether or not his parents participated. The six possibilities under this design are shown on the following page.

No electronic aids No parent help	Electronic aids without feedback No parent help	Electronic aids with feedback No parent help
No electronic aids Parent help	Electronic aids without feedback Parent help	Electronic aids with feedback Parent help

Research Conditions for Fifth Graders
In 1962-63
Figure 1

Assignment to Procedures. Throughout the project, assignment to primary research group has been by class rather than by individual pupil. Administrative conditions in the separate schools render assignment by individuals practically impossible in a study of this size. The number of classes assigned to each group in 1962-63 was determined by the amount of electronic equipment on hand. Otherwise, assignment was on a random basis. Thus, the number of classes to be assigned tape recorders was determined; and, from a list of all teachers in the project, this number was drawn at random. From those remaining, classes to be assigned record players were determined in like manner. Those still remaining were assigned to the no-electronic-aids condition. Under this scheme, approximately one-half of the fifth grade classes had no electronic aids, approximately one-fourth had electronic aids without feedback, and approximately one-fourth had electronic aids with feedback.

As indicated above, assignment to parent participation groups was not based on probability methods. Rather, it depended entirely on whether or not a child's parents volunteered. The number of such volunteers at fifth grade in 1962-63 was 2874, approximately 45 per cent of the total fifth grade population. This was the largest number of parent volunteers obtained during the project; and, in view of the fact that parent participation was in its third year and had thus lost much of the glitter of something new and exciting, this response was most heartening. Apparently, parent participation of this nature can be used by a school system as an on-going project.

__Measurement__ __and__ __Analysis__. The pertinent language skills, understanding and speaking ability, were measured at the end of each semester through listening comprehension and speaking tests previously developed by project personnel (8, 9). Also, a listening comprehension pre-test was administered the first week of school. Other information gathered for each pupil in the project included IQ, as measured by the Kuhlman-Anderson Test; the paragraph meaning (PM) score from the Stanford Achievement Test; grade point average (GPA) in academic subjects for the two previous school years; sex; amount of Spanish spoken in the home prior to the beginning of the project; and occupation (according to the Hollingshead scale) of the head-of-the-household.

In addition to the information on pupils, the following data were collected: class size, whether or not the Spanish teacher was also the regular classroom teacher, and the experience and formal preparation (TEP) of the Spanish teacher.

The primary technique used to analyze results was the analysis of covariance, through which the influence of certain measureable variables can be controlled or held constant from group to group. Pre-test, IQ, PM, and GPA were used as control variables in each separate analysis. In addition, the first semester test was used as a control in analyzing second semester results when it was desired to reflect only the amount learned the second semester. The dependent variable in each case was one of the language skills. Certain of the other variables were used as secondary independent or mitigating variables, so that their influence on the dependent variables and their interaction with the primary independent variables of experimental treatment and parent participation were measured.

B. Results

1. Experimental Treatment

Listening Comprehension. Overall, there were no significant differences between the primary research groups on either of the listening comprehension tests. Table 1 shows results of the covariance analysis of the second semester final, with and without the first semester final as a control variable. When the first semester final is used as a control, the results reflect only the amount learned during second semester; otherwise, the amount learned the complete year is reflected.

Table 1

ONE-DEMENSIONAL COVARIANCE ANALYSES
OF THE FIFTH GRADE SECOND SEMESTER LISTENING COMPREHENSION TEST
WITH AND WITHOUT THE FIRST SEMESTER TEST USED AS A CONTROL VARIABLE

With the First Semester Test

Source of Variation	Residual		
	Degrees of Freedom	Sum of Squares	Mean Square
Total	875	21, 294.872	
Within Groups	873	21,205.866	24.291
Between Groups	2	89.006	44.503

$$F = \frac{44.503}{24.291} = 1.832$$

$P > .05$

Without the First Semester Test

Source of Variation	Residual		
	Degrees of Freedom	Sum of Squares	Mean Square
Total	876	37,744.560	
Within Groups	874	37,684.533	43.117
Between Groups	2	60.027	30.013

$$F = \frac{30.013}{43.117} = 0.696$$

$P > .20$

Means of test scores and of other control variables used in analyses are given in table 2, and semester test scores adjusted by the covariance technique, are in table 3. (Group variances on each test are given in

Appendix A). Since the covariance analyses indicated that no differences between experimental groups were significant, no statistical comparison of individual group means was made.

Table 2

GROUP MEANS AT FIFTH GRADE
ON THE DEPENDENT AND CONTROL VARIABLES
USED IN LISTENING COMPREHENSION TEST ANALYSES

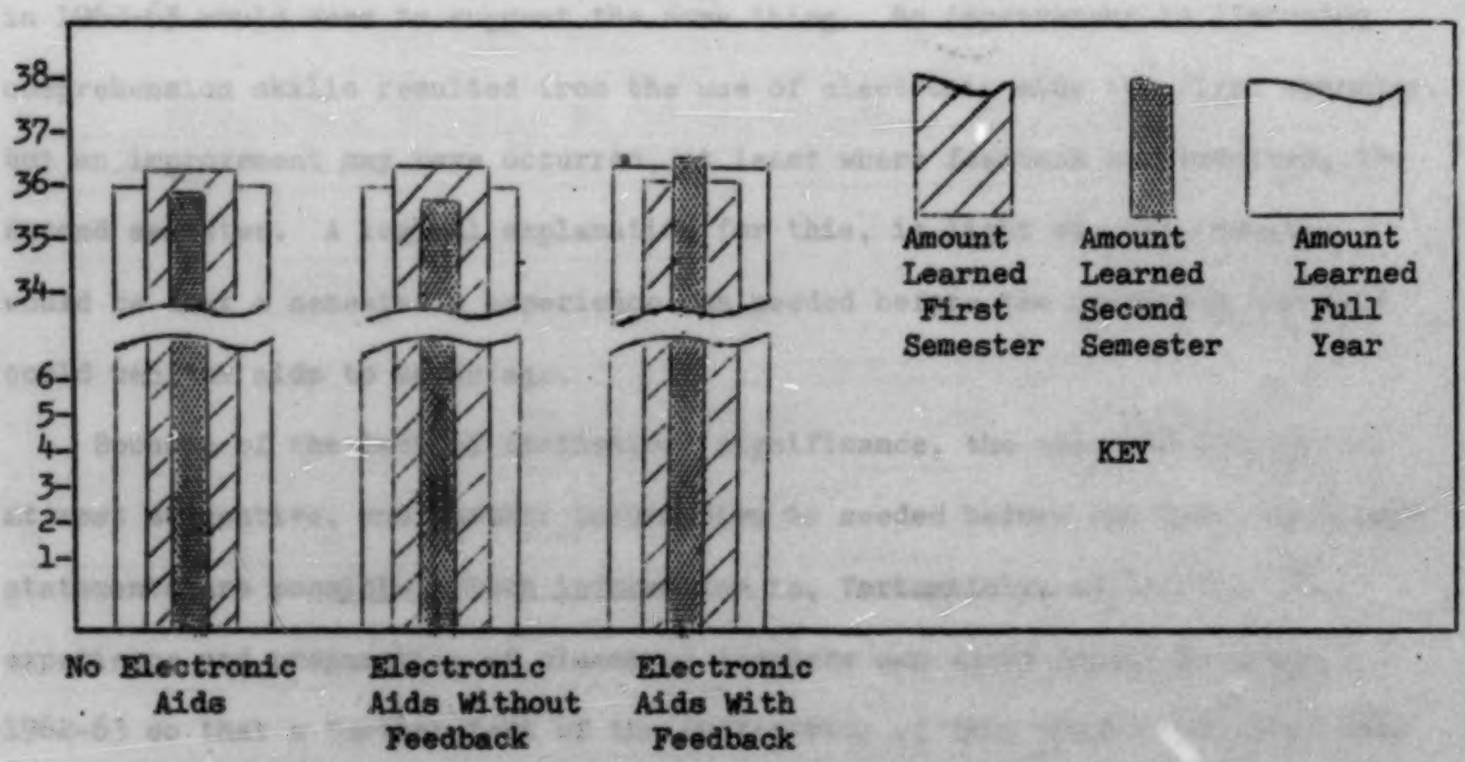
Variable	EXPERIMENTAL GROUP			
	No Electronic Aids	Electronic Aids Without Feedback	Electronic Aids With Feedback	Total
Second Semester Test	35.827	36.279	36.367	36.141
First Semester Test	36.347	36.914	36.173	36.472
Pre-test	8.923	8.664	8.601	8.739
PM	5.528	5.780	5.596	5.630
GPA	2.603	2.711	2.607	2.639
IQ	103.043	105.675	103.831	104.128

Table 3

ADJUSTED GROUP MEANS
ON THE FIFTH GRADE LISTENING COMPREHENSION TESTS

Semester test	Experimental Group			
	No Electronic Aids	Electronic Aids Without Feedback	Electronic Aids With Feedback	Total
First	36.467	36.590	36.359	36.472
Second -- second semester's learning reflected	35.975	35.856	36.620	36.141
Second -- full year's learning reflected	35.988	35.927	36.532	36.141
(N)	(323)	(280)	(278)	(881)

Though no differences were significant, a pattern can be seen in the comparison of means from one semester to the next. This pattern is more evident when the three sets of means in table 3 are plotted on a bar graph, as in figure 2.



Bar Graph of Adjusted Means Which Reflect Amount Learned the First Semester, Second Semester, and Full Year

Figure 2

As table 3 and figure 2 show, all three groups demonstrated quite similar amounts of learning the first semester; the adjusted first semester means were very close. During the second semester, however, the group using electronic aids with feedback achieved more than either of the other two groups, and this results in a higher mean score where learning for the whole year is reflected.

This outcome could be entirely the result of chance since no differences between means were statistically significant. The second semester differences would seem to merit consideration, however, because they fit a pattern observed with an entirely different group of pupils during the 1961-62 school year.

The 1961-62 results indicated that a certain amount of experience and/or preparation is necessary on the part of the classroom teacher before the electronic aids can be used profitably (2, pp. 7-12). The pattern observed in 1962-63 would seem to suggest the same thing. No improvement in listening comprehension skills resulted from the use of electronic aids the first semester, but an improvement may have occurred, at least where feedback was involved, the second semester. A logical explanation for this, in light of past results, would be that a semester's experience was needed before the classroom teachers could use the aids to advantage.

Because of the lack of statistical significance, the observed pattern is at most suggestive, and further information is needed before any more conclusive statements are possible. Such information is, fortunately, available. The experience and preparation of classroom teachers was again measured during 1962-63 so that a further test of the interaction of this teacher variable with the electronic aids method variable is possible.

Results of the two-dimentional analyses, with teacher experience and preparation (TEP) as one dimension and experimental treatment the other, are given in table 4. The first semester listening comprehension test is the dependent variable in one analysis, and the second semester test, with the first semester test as a control variable., is the dependent variable in the other, (As mentioned before, IQ, PM, GPA and pre-test are used as control variable in all such analyses.) Thus, the amount learned the first semester is reflected in one analysis, and the amount learned the second semester is reflected in the other.

Table 4 indicates that there were no statistically significant effects during either the first or second semesters. On the thought that full year results might be different, the second semester test was reanalyzed without the first semester test as a control, but the resulting F-ratios showed very little change. These analyses, therefore, shed no light on the problem.

Table 4

TWO-DIMENSIONAL COVARIANCE ANALYSES
OF FIFTH GRADE LISTENING COMPREHENSION TESTS
EXPERIMENTAL TREATMENT BY TEACHER EXPERIENCE AND PREPARATION

First Semester Test

Source of Variation	Residual			F-ratio	Probability
	Degrees of Freedom	Sum of Squares	Mean Square		
TEP	2	60.391	30.196	.622	>.20
Interaction	4	141.123	35.281	.726	>.20
Within Groups	903	43,836.972	48.546		

Second Semester Test

Source of Variation	Residual			F-ratio	Probability
	Degrees of Freedom	Sum of Squares	Mean Square		
TEP	2	99.169	49.584	1.969	> .05
Interaction	4	152.399	38.099	1.513	> .05
Within Groups	902	22,707.087	25.174		

A glimmer appears, however, when the adjusted means for the full year are examined in table 5. There the aids-with-feedback means are 34.951 for the low TEP group, 35.388 for the middle group, and 37.503 for the high group, and the differences between the middle and high groups and the low and high groups are statistically significant. For the first difference, the critical ratio (D_M/σ_{D_M}) is 2.115/1.127 = 1.877, which has probability of approximately .06; and for the second, the critical ratio is 2.552/1.200 = 2.127, with corresponding probability less than .05. Thus, at least for the aids-with-feedback pupils, a relationship exists between the development of listening comprehension skills and the experience and preparation of the classroom teacher. "Feedback pupils" whose teachers ranked high on TEP had an adjusted full-year score of 37.503, which was more than a full point higher than that of any other group in the two-way matrix. This suggests that the aids can be used effectively.

Table 5

ADJUSTED GROUP MEANS
ON FIFTH GRADE LISTENING COMPREHENSION TESTS
EXPERIMENTAL TREATMENT BY TEACHER EXPERIENCE AND PREPARATION

Experimental Treatment	Teacher Experience and Preparation								
	First Semester Test			Second Semester Test -- First Semester as Control			Second Semester Test No First Semester Control		
	Low	Middle	High	Low	Middle	High	Low	Middle	High
No Electronic Aids	35.736	36.279	35.911	36.262	36.490	35.851	35.851	36.465	35.851
Electronic Aids Without Feedback	36.135	37.132	35.510	35.481	35.716	35.998	35.353	36.297	35.425
Electronic Aids With Feedback	36.106	36.668	37.131	35.099	35.136	36.922	34.951	35.388	37.503
Total	35.978	36.651	36.205	35.659	35.861	36.365	35.420	36.101	36.288

Overall, however, the 1962-63 results, like those of 1961-62 related to electronic aids, are far from clear-cut. Many more questions remain unanswered than answered on the relationship between TEP and use of the aids.

So far only the interaction of teacher experience and preparation with experimental treatment has been considered. Information on several other possible influencing variable was collected; these include sex of pupil, prior Spanish spoken in the home, class size, and regular classroom versus special teacher for Spanish. Results of analyses in which these were used as secondary independent variables are shown in table 6. This table gives F-ratios and probabilities for the secondary categorizations and for the interactions between each secondary variable and experimental treatment. In addition, adjusted means for the secondary categories are shown. The second semester listening comprehension test is the dependent variable, and the first semester test is not used as a control so that learning for the whole year is reflected.

The only variable causing significant differences is prior Spanish in the home. Both the secondary categorization differences and the interaction are significant beyond the .001 level. This interaction merits further consideration and, to allow this, adjusted means for the interior cells of the two-dimensional matrix are shown in table 7.

Table 6
TESTS OF DIFFERENCES AND INTERACTIONS
FOUND IN TWO-DIMENSIONAL ANALYSES
SHOWING FULL YEAR'S LEARNING

Secondary Variable	Category	Test Mean	F-Ratio	Probability
Sex	Male	36.824	< 1.000	> .20
	Female	35.272		
Interaction			2.006	> .05
Prior Spanish in Home	Most of the time	39.433	6.084	< .001
	Part of the time	36.576		
	Very little of the time	35.633		
	None of the time	35.880		
Interaction			4.958	< .001
Class Size	33 or fewer pupils	36.003	< 1.000	> .20
	34 or more pupils	36.439		
Interaction			2.048	> .05
Regular or Other Teacher	Has pupils all day	35.653	2.145	> .05
	Has pupils part of day	36.433		
	Teaches Spanish only	36.244		
Interaction			1.920	> .05

Table 7

ADJUSTED MEANS
ON THE SECOND SEMESTER
LISTENING COMPREHENSION TEST
PRIOR SPANISH BY EXPERIMENTAL GROUP

Spanish Spoken in Home Prior to Beginning Program	Experimental Group		
	No Electronic Aids	Electronic Aids Without Feedback	Electronic Aids With Feedback
Most of the time	41.678	37.655	37.026
Part of the time	36.604	35.777	37.808
Very little of the time	34.253	37.557	35.051
None of the time	35.693	34.751	37.171

The interaction (or inconsistency from group to group) seems to be more logically explained when the means in table 7 are examined by row rather than by column. Children from homes where Spanish is spoken most of the time definitely do better without electronic aids. For the others, however, some form of the electronic aids produces the most learning, though the pattern is not clear by any means. Where Spanish is spoken part or none of the time, those with feedback did best; whereas, the very-little-of-the-time group did better without feedback. The latter group did better with feedback than with no electronic aids at all, however.

Just why the electronic aids are relatively so much less effective among children from homes where Spanish is spoken is uncertain. It has been suggested that these children are confused by differences between the Spanish taught in the school program and that spoken in their homes, and that the electronic aids heighten this confusion. Whatever the cause, however, children from Spanish speaking families comprise only about 7.5 per cent of the school population in Denver and would be a considerably smaller group in most other cities in the United States. Even in Denver, therefore, more than nine out of every ten children could profit from the use of electronic aids in some form, and the feedback condition seems the more desirable.

Speaking. Development of speaking skills under the three experimental conditions at fifth grade was also evaluated through covariance analysis. The relative amounts learned each semester and during the complete year were determined through use of speaking tests administered at the end of each semester, and through the selection of control variables. None of the one-dimensional analyses, comparing the performances of the three basic experimental groups, produced statistically significant results. The analysis reflecting learning for the whole year is shown in table 8; adjusted second semester means, with and without the first semester test used as a control variable, plus group numbers are given in table 9. The numbers here are much smaller than those used in the listening comprehension analyses because of the nature of the speaking tests. To achieve the test reliability needed for valid group comparisons, it was necessary that these tests be administered individually to pupils by project personnel. This process limited the number of pupils who could be tested.

The same pattern concerning relative amounts learned each semester is observed here as for the listening comprehension results, only in this case the reversal is complete. During the first semester, children with no aids performed best and those having aids with feedback were poorest. During the second semester, however, the aids-with-feedback condition produced the most learning, while the no-aids condition produced the least. These two trends balance themselves so that, for the complete year, the means are quite similar.

Table 8

ONE-DIMENSIONAL COVARIANCE ANALYSIS OF THE FIFTH GRADE SECOND SEMESTER SPEAKING TEST

Source of Variation	Residual		
	Degrees of Freedom	Sum of Squares	Mean Square
Total	171	1,446.927	
Within Groups	169	1,436.774	8.502
Between Groups	2	10.153	5.077

$$F = \frac{5.077}{8.502} = 0.597$$

$$P > .20$$

Table 9

ADJUSTED GROUP MEANS ON THE FIFTH GRADE SPEAKING TESTS

Semester	Experimental Group			
	No Electronic Aids	Electronic Aids Without Feedback	Electronic Aids With Feedback	Total
First	7.826	7.603	7.187	7.577
Second -- Second Semester's Learning Reflected	16.167	16.559	16.967	16.511
Second -- Full year's Learning Reflected	16.357	16.629	16.609	16.511
(N)	(71)	(55)	(49)	(175)

The speaking results, therefore, offer the same suggestion as was noted for listening comprehension--that the electronic aids require a semester's experience before they are generally used profitably.

The same secondary independent variables were used for the two-dimensional covariance analyses of speaking skills as of listening comprehension skills. Therefore, the results on teacher experience and preparation again allow a further test of the conjectured relationship between TEP and use of the electronic aids. The interaction between TEP and experimental treatment was not statistically significant, though the marginal categorizations by TEP produced an F-ratio of 7.087 where second semester results were considered. With n_1 of 2 and n_2 of 121, this F-ratio is significant beyond the .01 level. Adjusted means of the second semester speaking test, with the first semester test used as a control, are shown in table 10. Unfortunately, too few pupils with teachers low in TEP were tested to allow inclusion of the low TEP category in the two-dimensional analysis. This occurred because the samples for testing were drawn before the TEP questionnaires were evaluated, making stratification on TEP impossible.

Table 10

ADJUSTED FIFTH GRADE MEANS
ON THE SECOND SEMESTER SPEAKING TEST
RESEARCH GROUP BY TEACHER EXPERIENCE AND PREPARATION

Teacher Experience and Preparation	Experimental Group			
	No Electronic Aids	Electronic Aids Without Feedback	Electronic Aids With Feedback	Total
High	17.678	16.604	17.283	17.213
Middle	15.372	15.875	16.551	15.791

The results in table 10 do not follow the same pattern in the interior cells of the matrix that was found for listening comprehension. The pattern here, rather, resembles that of 1961-62 in which pupils of teachers in the middle TEP position performed relatively better with electronic aids, while those of teachers in the high position did best with no aids.

None of the other interactions was statistically significant, nor did any other secondary categorizations produce significant differences. Nevertheless, because prior Spanish produced significant results on the listening comprehension test, this variable was examined in further detail. The adjusted second semester means, reflecting the full year's learning, are shown in table 11. The limited numbers forced a combination of the "most" and "part of the time" categories. A comparison of table 11 with table 7 reveals that the pattern of means is precisely the same for speaking as for listening comprehension. That is, pupils from homes where Spanish is spoken do better with no electronic aids, while the others do better with some form of the aids. Furthermore, as on listening comprehension, the feedback condition produces the most favorable results where Spanish was not previously spoken in the home.

Table 11

ADJUSTED MEANS
ON THE SECOND SEMESTER
FIFTH GRADE SPEAKING TEST
PRIOR SPANISH BY EXPERIMENTAL GROUP

Spanish Spoken in Home Prior to Beginning Program	Experimental Group		
	No Electronic Aids	Electronic Aids Without Feedback	Electronic Aids With Feedback
Most or Part of the time	19.673	17.145	16.328
Very little of the time	15.522	16.605	15.729
None of the time	16.241	16.547	17.345

Overall, the speaking results generally support those of listening comprehension. They support fairly well the notion that the electronic aids are used to better effect as the classroom teacher gains experience with them, and they offer solid backing to the finding that electronic aids are most valuable if the pupil is not from a home where Spanish has been spoken previously.

2. Parent Participation

For the third consecutive year, parent participation proved of significant value to most pupils. The results in 1962-63 were, in fact, quite similar in every respect to those of the previous year. Parent participation had greater effect the first semester than it did the second, and a significant interaction between parent participation and prior Spanish in the home was found. The results were similar on both listening comprehension and speaking.

Table 12

TWO-DIMENSIONAL COVARIANCE ANALYSES
OF FIFTH GRADE LISTENING COMPREHENSION TESTS
PARENT PARTICIPATION BY PRIOR SPANISH SPOKEN IN HOME

First Semester Test

	Residual				
Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F-ratio	Probability
Parent Participation	1	98.982	98.982	2.635	> .05
Prior Spanish in Home	3	2,253.617	751.206	20.000	< .001
Interaction	3	264.564	88.188	2.347	> .05
Within Groups	808	30,349.201	37.561		

Table 12 (cont'd)

TWO DIMENSIONAL COVARIANCE ANALYSES
OF FIFTH GRADE LISTENING COMPREHENSION TESTS
PARENT PARTICIPATION BY PRIOR SPANISH SPOKEN IN HOME

Second Semester Test

Source of Variation	Residual Degrees of Freedom	Residual Sum of Squares	Residual Mean Square	F-ratio	Probability
Parent Particiaption	1	77.067	77.067	1.902	> .05
Prior Spanish in Home	3	1,940.100	646.700	15.064	< .001
Interaction	3	336.349	112.116	2.768	< .05
Within Groups	808	32,736.301	40.510		

Results of two two-dimensional covariance analyses, with parent participation and prior Spanish in the home as the separate independent variables, are shown in table 12. In one analysis, the first semester listening comprehension test is the dependent variable. In the other, the second semester test is the dependent variable, and is not controlled for first semester results. When only second semester learning is reflected (analysis not shown), none of the effects produce significant results.

Adjusted means for these two-dimensional breakdowns are given in table 13. In addition, this table includes the means which reflect only second semester learning.

This table shows that parent participation is most effective where the least amount of Spanish was spoken in the home prior to enrollment in the program. This has been the finding in previous years as well. Where no Spanish was spoken, the situation of a majority of the children, parent help increases learning to a highly significant degree, and it increases learning, though to a smaller degree, for those in the very-little-of-the-time category. On the other hand, where Spanish is spoken in the home most of the time, parent help is definitely detrimental. The occurrence of this effect at statistically significant levels over a three year span, with entirely different groups of pupils and parents, leaves no doubt that the effect is real. For most children, parent help in Spanish can be distinctly advantageous.

Table 13

ADJUSTED FIRST AND SECOND SEMESTER MEANS
FOR FIFTH GRADE LISTENING COMPREHENSION TESTS
PARENT PARTICIPATION BY PRIOR SPANISH SPOKEN IN HOME

Spanish Spoken in Home Prior to Beginning Program	Test					
	First Semester		Second Semester -- Semester Reflected		Second Semester -- Full Year Reflected	
	Parent Help	No Parent Help	Parent Help	No Parent Help	Parent Help	No Parent Help
Most of the time	42.462	41.893	36.486	38.099	40.571	41.811
Part of the time	36.474	38.667	36.705	36.385	36.865	37.981
Very little of the time	36.798	36.365	35.857	36.015	36.229	36.105
None of the time	36.004	34.446	36.074	35.351	35.926	34.081

The more disturbing and less understandable aspect of this pattern is the detrimental effect of parent help on those children from homes where Spanish is spoken natively. One explanation previously advanced is that there is a confusion between the "school Spanish" taught in the program and the local version of Spanish used at home. Thus, the parent might attempt to help the child, but his own Spanish is so different that he actually hinders. Another explanation, also previously advanced, is that a higher proportion of parent volunteers from the Spanish speaking group than from other groups may have failed to follow through with the activities. The result in this case could have been a negative attitude toward Spanish on the part of the child.

Fortunately, a partial test of the contending explanations was possible through use of the socio-economic status (SES) information available. As previously stated, the occupation of the head-of-household was determined for each child. Occupation is not a perfect indicator of SES, of course, but it is one of the most valid single indicators which can be readily applied to large groups.

It happens that a large proportion of Spanish speaking adults in the Denver area fall into the lower SES categories. A failure by Spanish speakers to continue the parent-participant activities would be expected to relate to this fact of social class, and such a failure would therefore be typical of other low SES groups. In this event, an interaction would exist between occupation and parent participation.

Table 14

TWO-DIMENSIONAL COVARIANCE ANALYSIS
OF THE SECOND SEMESTER LISTENING COMPREHENSION TEST
PARENT PARTICIPATION BY OCCUPATION OF HEAD-OF-HOUSEHOLD

Source of Variation	Residual			F-ratio	Probability
	Degrees of Freedom	Sum of Squares	Mean Square		
Parent Participation	1	198.313	198.313	4.937	< .05
Occupation	2	11.317	5.659	0.141	> .20
Interaction	2	12.258	6.129	0.153	> .20
Within Groups	583	23,420.228	40.172		

To test this idea, children in the "part" and "most of the time" categories on prior Spanish were eliminated so that the occupation categories would be free of Spanish speakers, and parent participation was run against occupation in a two-dimensional analysis. The results with full year learning reflected are given in table 14.

When the children from homes where Spanish is spoken natively are eliminated, the overall difference between those with and those without parent help becomes statistically significant. Neither the interaction nor the differences produced by the categorization by occupation are significant. Adjusted means relating to table 14 are given in table 15. These means are quite consistent; children with parent help do better than those without such help in every occupation category, and, further, occupation shows no relationship to performance. Evidently, a similar proportion of parent-participants at all SES levels followed through with the activities

Table 15

ADJUSTED SECOND SEMESTER
LISTENING COMPREHENSION TEST MEANS
PARENT PARTICIPATION BY OCCUPATION OF HEAD-OF-HOUSEHOLD

Occupational Level	Parent Participation		Total
	Parent Help	No Parent Help	
High	36.364	34.452	35.394
Middle	35.871	35.053	35.441
Low	35.906	34.799	35.235
Total	35.996	34.863	35.384

The problem, therefore, would appear to lie with Spanish spoken natively in the home and not with a failure by Spanish speaking parents to continue with the activities. This finding enhances the value of the parent help method, for it shows that it will work at all levels of social class.

On the speaking results for the full year, the parent help pupils performed significantly better than those without parent help. The F-ratio on the one-dimensional analysis was 4.267 which, with n_1 of 1 and n_2 of 145, is significant beyond the .05 level. The adjusted means were 17.043 for the parent help group and 15.780 for the others. Thus, parent help made a statistically significant contribution to the speaking skill. The lack of numbers on the speaking test made testing the effects of prior Spanish through a two-way breakdown impossible.

C. Summary

In summary, fifth grade results show that the electronic aids, especially those with feedback, are a desirable addition to the classroom Spanish program. An exception to this occurs among children from homes where Spanish is spoken natively. This exception affects very few children, however; the vast majority can profit from the use of electronic aids.

Parent participation, for the third consecutive year, also proved to be valuable. Again the exception is among children of native speakers.

It was found previously that the eclectic method is best for direct teaching, and results over the total span of the project leave no doubt that well-prepared and experienced teachers improve the quality of instruction. A carefully prepared, on-going inservice training program would therefore seem to be a must for any school system combining television, electronic aids, and other new techniques as they have been combined in the Denver-Stanford project.

The following activities at fifth grade are therefore recommended: basic instruction by television, teacher-directed instruction by the eclectic method, electronic aids with feedback, parent help at home, and an on-going teacher inservice training program.

III. ACTIVITIES AND RESULTS AT SIXTH GRADE

A. Research Design

Experimental Procedures. Reading and writing are introduced at sixth grade in the Denver Public Schools elementary Spanish program, and a major portion of project effort at sixth grade in 1962-63 went into the evaluation of ways to introduce the reading and writing skills. At the same time, the teaching of listening comprehension and speaking skills was continued.

The most interesting innovation introduced in the project with regard to reading and writing has undoubtedly been automated instruction. Automated programs, designed to teach children to read and write the Spanish they have already learned to understand and speak, were developed during the first two years of research (10).

In 1961-62, reading and writing instruction entirely by the automated approach and entirely by the teacher-directed approach were compared. Results of this comparison led to the conclusion that automated instruction is indeed an effective and useful teaching device, but that it does not seem capable of carrying the entire teaching load, at least at the elementary school level. In the report on 1961-62 results, it was hypothesized that automated instruction would be most effective when combined in some way with teacher-directed instruction.

This hypothesis was tested in 1962-63 through various combinations of automated and teacher-directed instruction. In setting up research groups, a base for comparison was first established by repeating the automated only and teacher-directed only conditions from the previous year. The automated-only groups were in turn divided so that original (O) and revised (R) versions of the materials could be used. (The two versions are described in a previous report. See note 3). The original version was used in combinations with teacher-directed instruction.

All direct in-school reading and writing instruction occurred during a 30-minute period from 12:45 to 1:15 each Wednesday. In addition, each sixth grade pupil was given audio-lingual instruction on Tuesdays and Thursdays. The audio-lingual instruction was handled in much the same way as for fifth grade; that is, the children first watched a 15-minute television program and then had 15 minutes of teacher-directed instruction by the eclectic method. This instruction was the same for all sixth graders and was therefore constant in the experimental design.

The design incorporated two additional activities which were introduced in 1962-63. One was a special area of the classroom, termed the "Spanish corner", in which Spanish books and newspaper, record players with Spanish recordings, tape recorders, and assorted cultural artifacts were placed. Each child in classes where the corner was used was allowed approximately 30 minutes a week, on a scheduled basis, in the corner. The child was not directly supervised while in the Spanish corner, but was allowed to pursue any activity he liked.

The second new activity was regularly assigned homework. Some of the children were assigned specific sections of the automated instruction booklets to be completed at home, while others were assigned additional reading in elementary-level Spanish readers. (These readers were also used in the classroom in some instances, and use of them was termed "extended reading.")

The research groups, which were derived by combining the different activities in various ways, are shown in table 16. Note that the first four groups consist of activities involving no direct face-to-face instruction by the classroom teacher, while in the last six, the classroom teacher handles at least part of the instruction directly. The activities listed in table 16 are in addition to the standard audio-lingual instruction, of course. The table also shows abbreviated designations which, to conserve space, will be used in the remainder of this report to indentify the different experimental groups. (Unless otherwise indicated, the original version of the automated materials was used.)

Table 16

ACTIVITIES OF RESEARCH GROUPS AT SIXTH GRADE DURING THE 1962-63 SCHOOL YEAR

Group Activities	Designation
Automated instruction in school	As
Automated instruction in school, revised version of automated materials	As(R)
Extended reading in school and automated instruction at home	EsAh
Extended reading in school and automated instruction at home, revised version of automated materials	EsAh(R)
Teacher-directed instruction	Td
Teacher-directed and automated instruction in school	TdAs
Teacher-directed instruction in school and automated instruction at home	TdAh
Teacher-directed and automated instruction in school and extended reading at home	TdAsEh
Teacher-directed and automated instruction in school and Spanish corner	TdAsC
Teacher-directed instruction in school, automated instruction at home, and Spanish corner	TdAhC

In still another innovation at sixth grade, seven teachers were set apart from the research design and given complete freedom to handle the classroom instruction in any way they liked. (Their pupils viewed the TV lessons.) The only restrictions were that each teacher in this group was required to keep a complete, written record of his activities relative to Spanish instruction, and each was asked to attend special meetings at which the different activities were discussed. These teachers were designated the "tomorrow's classroom" group.

Finally, parent participation was encouraged at sixth grade as well as at fifth grade. This was the second year in which parent-help was tried at sixth grade, and its use was essentially a replication of the 1961-62 trial which showed that parent help continues to be beneficial to pupils in their second year of Spanish instruction. As at fifth grade, pupils with parent help were scattered throughout the research design so that each research group consisted of pupils with and without parent help.

Assignment to Procedures. Random assignment was employed at sixth grade in so far as possible, though conditions necessitated some departure from it. In the first place, some classroom teachers handled both fifth and sixth grade Spanish instruction. Since these teachers were occupied with fifth grade audio-lingual instruction during the 12:45 to 1:15 period each Wednesday, they were not available for reading and writing instruction. Teachers in this situation were assigned to the two automated-only conditions, As and As(R), which required no direct teaching on Wednesdays. These teachers, therefore, provided the audio-lingual instruction for their sixth grade pupils on Tuesdays and Thursdays, and they were replaced on Wednesdays by other teachers who acted mainly as proctors.

The remaining teachers, except for the seven in the "tomorrow's classroom" group, were randomly assigned to the eight other research groups. The seven with unrestricted classroom practice were selected in two stages. First, the proposed treatment was explained to all of the sixth grade teachers, and volunteers were requested. Some 50 teachers responded. Then the seven were chosen randomly from those who volunteered. This self-selection procedure was followed deliberately to assure interested teachers in the "tomorrow's classroom" group.

As in all previous cases, parent participation was on a volunteer basis. The only restriction at sixth grade was that parents must also have participated the previous year when their child was in fifth grade. Of some 3,000 parents who participated in 1961-62, 1770 elected to continue their participation in 1962-63. A substantial (though undetermined) number of the remainder did not continue because of unavoidable circumstances, such as moving from the city.

Measurement and Analysis. The two dependent variables at fifth grade, listening comprehension and speaking, served the same role at sixth and were measured through special instruments which covered sixth grade content. In addition, reading and writing was of concern at sixth grade and served as a third dependent variable. This skill was measured at the end of each semester through 66-item reading and writing tests.

The control and secondary independent variable were about the same at sixth grade as for fifth. IQ, PM, GPA, and listening comprehension pre-test were used as standard control variables, and sex, occupation of the head-of-household, class size, and teacher experience and preparation (TEP) were used as secondary independent variables.

An addition was teacher and pupil attitude toward Spanish as an academic subject. Attitude was measured through a set of scales devised especially for the project by Paul I. Jacobs and Milton H. Maier of the Educational Testing Service. Three separate scales measured pupil pre-attitude during the first week of the school year, teacher attitude about two-thirds of the way through the first semester, and pupil post-attitude at the end of the first semester. The reported reliabilities for these scales were approximately .50 for pupil pre-attitude, .85 for teacher attitude, and .86 for pupil post-attitude. A complete description of these scales and their development is available from the Educational Testing Service (11).

Attitude results were used almost entirely as secondary independent variables, though, as will be seen in the results section, pupil post-attitude was used as a dependent variable in one or two cases.

As stated previously, the differences between research groups at sixth grade depended almost entirely on the type of reading and writing instruction involved, and the reading and writing skill would therefore seem to be the most important dependent (or criterion) variable. This is not true, however, because the language skills interact. The instructional procedure which is best in terms of reading and writing is not necessarily the best in terms of listening comprehension or speaking, though ideally this would be the case. All skills were analyzed, therefore, for a complete evaluation of research procedures. Covariance analysis was again the primary statistical technique. As at fifth grade, IQ, PM, GPA, and listening comprehension pre-test were used as controls in all analyses which employed one of the language skills as dependent variable. Also, first semester results were used as control variables when it was desired to reflect only the amount learned the second semester.

B. Results

1. Experimental Treatment

Listening Comprehension. One-dimensional analyses of the second semester test were made with and without the first semester test used as a control variable, and results of these are shown in table 17. Highly significant F-ratios occurred in both cases. Adjusted means are shown in table 18, and they prove to be quite similar, indicating that the different treatments had relatively the same effect throughout the school year.

Table 17

ONE-DIMENSIONAL COVARIANCE ANALYSES OF THE SIXTH GRADE SECOND SEMESTER LISTENING COMPREHENSION TEST WITH AND WITHOUT THE FIRST SEMESTER TEST USED AS A CONTROL VARIABLE

With the First Semester Test				Without the First Semester Test			
Source of Variation	Residual			Source of Variation	Residual		
	Degrees of Freedom	Sum of Squares	Mean Square		Degrees of Freedom	Sum of Squares	Mean Square
Total	1,848	51,990.781		Total	1,849	69,324.729	
Within Groups	1,839	51,175.995	27.828	Within Groups	1,840	68,079.610	37.000
Between Groups	9	814.786	90.532	Between Groups	9	1,245.119	138.347
$F = \frac{90.532}{27.828} = 3.253$ $P < .001$				$F = \frac{138.347}{37.000} = 3.739$ $P < .001$			

Table 18

ADJUSTED SIXTH GRADE MEANS ON THE SECOND SEMESTER LISTENING COMPREHENSION TEST

Experimental Group	Test Mean		(N)
	Second Semester's Learning Reflected	Full Year's Learning Reflected	
As	31.873	31.168	(164)
As(R)	32.281	32.312	(179)
EsAh	33.050	33.086	(112)
EsAh(R)	31.967	31.929	(117)
Td	32.618	32.978	(222)
TdAs	32.952	33.066	(201)
TdAh	32.033	32.309	(230)
TdAsEh	31.508	31.022	(174)
TdAsC	33.769	33.735	(242)
TdAhC	32.235	32.407	(213)

Table 18 shows the prediction regarding the combination of automated and teacher-directed instruction to be at least partially confirmed. The TdAs condition is clearly superior to either As or As(R), and it is slightly better than Td, though the difference is not statistically significant. However, by adding one more ingredient, the Spanish corner, to the combination a dramatic increase in learning occurs. The best performance by far was achieved by those children in the TdAsC condition, that is, by those with automated and teacher-directed instruction in school and with a Spanish corner. In terms of the listening comprehension (or understanding) skill, therefore, TdAsC is the desirable combination.

The two-dimensional breakdown, with experimental groups divided according to teacher experience and preparation (TEP), produces results which support quite strongly some previous conclusions regarding the teacher variables. These results were similar each semester, so only the analysis reflecting the full year's learning is shown. Table 19 gives this analysis, and table 20 shows the corresponding adjusted group means.

Table 19

TWO-DIMENSIONAL COVARIANCE ANALYSIS OF THE
SECOND SEMESTER SIXTH GRADE LISTENING COMPREHENSION TEST
EXPERIMENTAL TREATMENT BY TEACHER EXPERIENCE AND PREPARATION

Source of Variation	Residual			F-ratio	Probability
	Degrees of Freedom	Sum of Squares	Mean Square		
TEP	1	43.358	43.358	1.253	> .20
Interaction	9	1,775.604	197.289	5.449	< .001
Within Groups	1,830	66,258.648	36.207		

The means for those six groups with teacher-directed instruction form a confusing pattern and suggest no ready conclusions. Among the four groups without teacher-directed instruction in reading and writing, however, the pattern is much more consistent and meaningful. In three of these groups, pupils whose teachers rated high on the TEP scale performed better than those whose teachers rated low, and the difference between means in the one exception, AS(R), was quite small. Furthermore, the differences between the low and high TEP pupils in the EsAh and EsAh(R) groups were by far the largest produced by the break on TEP. Thus the conditions with the least amount of direct supervision in reading and writing, where pupils were more on their own, were the ones on which the experience and preparation of the teacher handling the audio-lingual instruction had the most effect. This supports the conclusion, stated in a previous report (2), that the teacher exerts a motivating effect that is most noticeable when the pupil is free to do more or less as he likes. A more stringent test of this hypothesis will occur when reading and writing skill rather than listening comprehension is the dependent variable.

Two-dimensional analyses were also run with class size and sex as the secondary independent variables, and the only statistically significant effect was an interaction between class size and experimental treatment. No such analysis was possible with the regular-versus-special teacher variable because of an unfortunate distribution of numbers; only two of the ten research groups had at least two teachers in every cell of the matrix. A one-dimensional analysis showed no significant difference between pupils of special teachers and those of regular teachers.

The F-ratio for the interaction between class size and experimental treatment was 3.462, which with n_1 of 9 and n_2 of 1,757, is significant beyond the .001 level. The adjusted group means for the two-dimensional breakdown are given in table 21.

Table 20

ADJUSTED MEANS AT SIXTH GRADE ON THE SECOND SEMESTER LISTENING COMPREHENSION TEST EXPERIMENTAL TREATMENT BY TEACHER EXPERIENCE AND PREPARATION

Experimenatl Treatment	Teacher Experience and Preparation	
	Low	High
As	30.699	31.885
As(R)	32.434	32.157
EsAh	32.489	36.201
EsAh(R)	30.561	36.721
Td	32.931	33.092
TdAs	33.563	31.965
TdAh	32.016	33.086
TdAsEh	31.168	30.708
TdAsC	32.979	35.268
TdAhC	33.451	30.834
Total	32.351	32.722

Table 21

ADJUSTED SECOND SEMESTER LISTENING COMPREHENSION TEST MEANS EXPERIMENTAL TREATMENT BY CLASS SIZE

Experimental Treatment	Class Size	
	29 or fewer	30 or more
As	29.731	32.602
As(R)	30.722	32.282
EsAh	34.921	32.441
EsAh(R)	31.137	32.269
Td	33.667	32.803
TdAs	33.941	33.175
TdAh	33.413	31.938
TdAsEh	30.082	31.582
TdAsC	35.085	33.205
TdAhC	33.040	31.987
Total	32.472	32.454

The means in table 21 fit a meaningful pattern when considered by experimental treatment. In five of the six treatments involving teacher-directed instruction, pupils in smaller classes learned the most; whereas, in three of the four treatments with no teacher-directed instruction, the higher means were achieved by those in larger classes. Thus, smaller classes seem advantageous only where direct teacher instruction is involved. Once more, however, the analysis of reading and writing results will provide a more stringent test.

To summarize, the listening comprehension results suggest that a combination of teacher-directed and automated reading and writing instruction in school, plus a Spanish corner, is desirable. Furthermore, they suggest that a direct relationship exists between amount learned and the experience and preparation of the classroom teacher and that this relationship is strongest when the pupil is on his own. Finally, smaller classes seem important only for direct, face-to-face teaching.

Reading and Writing. One-dimensional covariance analyses of the second semester reading and writing test are given in table 22 and the related adjusted means are in table 23. Reading and writing results, like listening comprehension, were quite similar both semesters, so only second semester and full year learning is shown in the tables.

The strong relationship between the reading and writing and listening comprehension skills is evident in table 23, for the reading and writing results are quite similar to those of listening comprehension discussed previously. As before, teacher-directed instruction alone is better than automated instruction alone, but the combinition of the two produces still more learning. In this case, however, the difference between the Td and TdAs conditions is larger than it was for listening comprehension -- in fact, the difference of 2.543 between the means of these groups where the full year is reflected is itself significant beyond the .05 level. So the hypothesis that the combination would be superior to either practice alone is definitely confirmed.

Table 22

ONE-DIMENSIONAL COVARIANCE ANALYSES OF THE SIXTH GRADE SECOND SEMESTER READING AND WRITING TEST WITH AND WITHOUT THE FIRST SEMESTER TEST USED AS A CONTROL VARIABLE

With the First Semester Test

Source of Variation	Residual Degrees of Freedom	Residual Sum of Squares	Residual Mean Square
Total	1,848	79,600.470	
Within Groups	1,839	78,230.491	42.540
Between Groups	9	1,369.979	152.220

$F = \frac{152.220}{42.540} = 3.578$

$P < .001$

Without the First Semester Test

Source of Variation	Residual Degrees of Freedom	Residual Sum of Squares	Residual Mean Square
Total	1,849	131,295.900	
Within Groups	1,840	126,666.912	68.841
Between Groups	9	4,628.998	514.332

$F = \frac{514.332}{68.841} = 7.471$

$P < .001$

Table 23

ADJUSTED SIXTH GRADE MEANS ON THE SECOND SEMESTER READING AND WRITING TEST

Experimental Group	Test Mean: Second Semester's Learning Reflected	Test Mean: Full Year's Learning Reflected	(N)
As	15.924	13.970	(164)
As(R)	16.885	16.166	(179)
EsAh	16.907	16.785	(112)
EsAh(R)	15.569	15.188	(117)
Td	17.346	17.474	(222)
TdAs	18.778	20.017	(201)
TdAh	17.254	17.711	(230)
TdAsEh	17.710	17.367	(174)
TdAsC	17.622	18.608	(242)
TdAhC	18.313	18.056	(213)

Results for both listening comprehension and reading and writing skills, therefore, indicate that a combination of activities is desirable. There is some disagreement on which combination is best, however. The listening comprehension results showed the addition of a Spanish corner to the teacher-directed and automated in school combination to be desirable, but table 23 shows less learning for this condition than for TdAs alone. This disagreement is not of major proportion, however, since the TdAsC means are quite close to those of TdAs. The larger difference -- where full year learning is reflected -- is 1.409 points, which is not statistically significant. A look back at table 18 shows small differences between these groups on listening comprehension also, so either combination would seem desirable in terms of the skills so far examined.

At least two other noteable points appear in table 23. First, automated instruction appears to be more useful as school work than as homework. In the two cases where As and Ah can be compared -- TdAs versus TdAh and TdAsC versus TdAhC -- the As means are generally higher. (Table 18 shows the As means are also higher on listening comprehension results.) Note, however, that in both comparisons Td is a common element, so that the classroom teacher could have been assisting the children with their automated instruction in school. Whether a pure As-Ah comparison would give different results cannot be determined from the results at hand. It would make little difference if a change did occur, however, because the desirability of teacher-directed instruction as a part of the combination has been firmly established.

The second point involves the original and revised versions of the automated materials. The 1961-62 results indicated rather firmly the desirability of the original version (3). Table 23 does not give such a clear-cut picture, however. For in-school use, the revised version seems better. Furthermore, it is not clear that the difference in school and home environments is a contributing factor here because the home-use comparisons are contaminated by another variable -- extended reading in school. It is thus not possible to state with any confidence which version of the automated materials seems best.

The two-way breakdown of reading and writing results by experimental treatment and by teacher experience and preparation confirms even more strongly than the listening comprehension results the previous conclusions regarding TEP. The two-dimensional covariance analysis is given in table 24 and the adjusted means in table 25.

Table 24

TWO-DIMENSIONAL COVARIANCE ANALYSIS OF THE
SECOND SEMESTER SIXTH GRADE READING AND WRITING TEST
EXPERIMENTAL TREATMENT BY TEACHER EXPERIENCE AND PREPARATION

Source of Variation	Degrees of Freedom	Residual Sum of Squares	Mean Square	F-ratio	Probability
TEP	1	1,038.749	1,038.749	15.555	< .001
Interaction	9	3,424.632	380.515	5.698	< .001
Within Groups	1,830	122,203.531	66.778		

Table 25

ADJUSTED MEANS AT SIXTH GRADE
ON THE SECOND SEMESTER READING AND WRITING TEST
EXPERIMENTAL TREATMENT BY TEACHER EXPERIENCE AND PREPARATION

Experimental Treatment	Teacher Experience and Preparation	
	Low	High
As	14.142	13.711
As(R)	16.068	16.296
EsAh	15.303	24.535
EsAh(R)	13.419	21.378
Td	17.245	18.048
TdAs	20.793	18.277
TdAh	17.594	18.018
TdAsEh	16.623	18.979
TdAsC	17.013	21.840
TdAhC	17.377	19.079
Total	16.848	18.449

Both the difference between means of the low and high TEP categories and the interaction are highly significant statistically. As the "total" figures indicate, there is a direct realtionship between TEP and test score. This relationship is generally demonstrated through the table, in fact, since the high TEP group had the highest mean score in eight of the ten research procedures. Overall, however, the differences tend to be relatively small, on the order of one to two points.

In view of this general pattern, the differences for the two groups with the least amount of teacher supervision -- EsAh and EsAh(R) -- are rather astounding. In each group, children with high TEP teachers have means about 60 per cent higher than those with low TEP teachers. This finding is even more remarkable when it is remembered that the teacher of reference here is the one who handles audio-lingual instruction on Tuesdays and Thursdays and has little to do with the pupil's reading and writing activities. That the characteristics of this teacher have such an impact on the acquistion of reading and writing skills -- much more impact than on listening comprehension skills with which the teacher is directly involved -- suggests strongly that the teacher plays a major role in motivating the pupil. In other words, the teacher inspires the child to work in those situations where he is not under direct supervision. This type of influence might well be felt under many different conditions. It could carry over into homework, for example. The value of homework per se in any subject might depend more on the quality of instruction provided in class than on any other single factor. Table 25 shows that means of the three additional groups involving homework -- TdAh, TdAsEh, and TdAhC -- do, in fact, support this notion.

In any event, the importance of teacher experience and preparation is established, and the statement made previously, that an ongoing inservice program is vital in a program of this nature, has received additional support.

Regarding the other secondary independent variables, the situation was much the same for reading and writing as for listening comprehension. The analysis matching experimental treatment against class size was the only one which produced statistically significant results. The derivation of F-ratios for this analysis is shown in table 26, and the adjusted means are in table 27.

The directions of differences in table 27 follows those of the listening comprehension results (table 21) exactly. In three of the four groups with no teacher-directed instruction, children in larger classes scored higher on the reading and writing test; and, in five of the six groups with teacher-directed instruction, performance was higher where the number in the class was smaller. This outcome again suggests that having smaller classes is important only in the direct teaching situation where individual attention is required.

An even stronger test of the class size effect would be provided by comparing very large classes -- with, perhaps, 40 pupils or more -- to very small classes -- with 20 pupils or less. There were too few such extreme cases to allow a valid comparison, however. The distribution of classes by class size is given in Appendix B.

Table 26

TWO-DIMENSIONAL COVARIANCE ANALYSIS OF THE
SECOND SEMESTER SIXTH GRADE
READING AND WRITING TEST
GROUP BY CLASS SIZE

Source of Variation	Residual Degrees of Freedom	Residual Sum of Squares	Mean Square	F-ratio	Probability
Class Size	1	318.691	318.691	4.642	< .05
Interaction	9	2,648.756	294.306	4.287	< .001
Within Groups	1,757	120,612.319	68.674		

Table 27

ADJUSTED SECOND SEMESTER READING AND WRITING TEST MEANS EXPERIMENTAL TREATMENT BY CLASS SIZE

Experimental Treatment	Class Size 29 or fewer	 30 or more
As	13.388	15.340
As(R)	15.125	16.276
EsAh	22.167	14.767
EsAh(R)	14.504	15.948
Td	19.091	16.986
TdAs	20.389	19.952
TdAh	18.933	17.270
TdAsEh	16.389	18.112
TdAsC	21.690	17.374
TdAhC	18.692	17.595
Total	17.871	16.967

This raises interesting team teaching possibilities. Large classes could be used for viewing the television lessons and for working with automated materials, and small classes could be used for teacher-directed instruction related to the eclectic audio-lingual method, the reading and writing activities, and the use of electronic aids. With careful scheduling in this kind of arrangement, each child could have more individual attention with no increase in the number of teachers.

Speaking. The one-dimensional analysis of the second semester speaking test, with full year's learning reflected, is given in table 28. The numbers are small, of course, because of the nature of the test.

The adjusted means are given in table 29. Because of the small numbers, only five of the groups are represented in this table, but these form a meaningful pattern.

Table 28

ONE-DIMENSIONAL COVARIANCE ANALYSIS OF THE SIXTH GRADE SECOND SEMESTER SPEAKING TEST

Source of Variation		Residual	
	Degrees of Freedom	Sum of Squares	Mean Square
Total	214	5,893.861	
Within Groups	209	5,333.580	25.520
Between Groups	5	560.281	112.056

$$F = \frac{112.056}{25.520} = 4.391$$

$$P < .001$$

Table 29

ADJUSTED MEANS ON THE SECOND SEMESTER SPEAKING TEST

Experimental Treatment	Test Mean
As(R)	21.290
Td	22.825
TdAs	20.510
TdAsC	20.226
TdAhC	24.787
Total	21.688

The two highest means in table 29 are for those practices where the classroom teacher spent the full 30 minutes each Wednesday in direct, face-to-face instruction. This is understandable. Assuming that speaking is

improved only through actual practice, a child who spends part of the available time with automated instruction or with reading only is not likely to develop his speaking skills as highly as one who speaks Spanish the whole time -- even though the speaking takes place in what is primarily reading and writing instruction. Thus, if speaking is the criterion, the combination of automated and teacher-directed instruction in school would be less desirable than teacher-directed instruction alone.

Which procedure, then, is most effective for sixth grade pupils? This depends on which skill is to be emphasized since the best results on each skill were produced by different procedures. The fact is, of course, that all of the skills are important and should be emphasized, and a compromise solution is needed.

Fortunately, a very good compromise seems available. The results on listening comprehension and reading and writing indicated, as previously noted, that either the TdAs (teacher directed and automated instruction in school) or TdAsC (teacher-directed and automated instruction in school and a Spanish corner) conditions would be desirable. The results in table 29 suggest that the Spanish corner may be of some aid in developing the speaking skills, presumably because of the electronic aids in the corner. The TdAsC condition is not significantly different from TdAs, but TdAhC is significantly better than Td. Though the results are not clear-cut, the Spanish corner shows potential as an aid to speaking.

The compromise, therefore would be TdAsC. With this procedure, conditions are close to optimum for both the listening comprehension and reading and writing skills, and the potential for improving speaking skills is present. Since this potential presumably exists because of the presence of electronic aids in the Spanish corner, the situation is similar to that at fifth grade. Teachers need special preparation in directing use of the aids, and they need experience. Therefore, the effectiveness of the TdAsC procedure would be dependent upon an accompanying inservice training program.

2. The "Tomorrow's Classroom" Treatment

As noted previously, seven sixth grade teachers were removed from the experimental design and allowed to teach Spanish entirely as they wished. These teachers were selected randomly from a group who volunteered for this method, so a selection factor was operating. Self-selection was deliberately allowed in this instance in an attempt to get highly interested teachers in the group.

The results obtained by these teachers are quite exciting. One-dimensional covariance analyses comparing results of the "tomorrow's classroom" group with those of all others combined, are given in table 30, and adjusted group means are in table 31. The dependent variables here are the second semester listening comprehension and reading and writing tests, and learning for the full year is reflected.

Pupils in the "tomorrow's classroom" group did considerably better than the others on both tests, and the difference on reading and writing is little short of astounding. The "tomorrow's classroom" mean on reading and writing is almost 50 per cent higher than the other mean. These results show what highly motivated and highly interested teachers can do for pupils.

This outcome should not be taken to mean it is best to let every teacher do what he wishes, however, in spite of the fact that the "tomorrow's classroom" teachers had a free hand. Quite the contrary, these teachers used all of the procedures and aids available to the regular research groups, and they invented a number of new ones on their own. The results show, rather, the value of the materials and methods now at hand when used by a really interested teacher, and they suggest that even more varied activities are useful.

Table 30

COVARIANCE ANALYSES
OF SECOND SEMESTER TESTS
"TOMORROW'S CLASSROOM" COMPARED TO OTHER GROUPS

Listening Comprehension Test

Source of Variation	Residual Degrees of Freedom	Residual Sum of Squares	Mean Square
Total	2,115	80,300.023	
Within Groups	2,114	79,131.008	37.432
Between Groups	1	1,169.015	1,169.015

$$F = \frac{1,169.015}{37.432} = 31.230$$

$P < .001$

Reading and Writing Test

Source of Variation	Residual Degrees of Freedom	Residual Sum of Squares	Mean Square
Total	2,115	156,920.219	
Within Groups	2,114	150,751.932	71.311
Between Groups	1	6,168.287	6,168.287

$$F = \frac{6,168.287}{71.311} = 86.498$$

$P < .001$

Table 31
ADJUSTED MEANS
ON THE SECOND SEMESTER TESTS
'TOMORROW'S CLASSROOM" COMPARED TO OTHER GROUPS

Test	Mean "Tomorrow's Classroom"	Mean Experimental Groups Combined
Listening Comprehension	35.932	32.574
Reading and Writing	25.220	17.527

Several of the "tomorrow's classroom" teachers came up with interesting activities not otherwise tried in the project, and a number of these should be considered in designing an elementary school Spanish program. A description of the "tomorrow's classroom" teachers and the methods they employed will be provided in a subsequent report.

3. Parent Participation

Parent participation proved valuable again at sixth grade, and, in fact, the decline in its effect the second semester, noted over three years at fifth grade, did not occur. Covariance analyses of listening comprehension results for the two semesters are shown in table 32, and the adjusted means are in table 33.

The lack of a second semester decline, though heartening, is a little puzzling since it has been noted consistently in other results. Perhaps it is related to the double selection involved. Parent participation at sixth grade was restricted to those parents who had participated the previous year when their children were fifth graders, and not all of the parents elected to continue the second year. It would seem safe to assume that, although some drop-outs occurred because of moving and other uncontrollable reasons, many parents did not continue because of low interest in the method. Those who did continue would tend to have high interest. Selection was involved first at fifth grade and then, after a year's trial, at sixth grade, and those parents still in the program would be those most likely to follow through with the assigned activities.

Whether the double selection explanation is valid or not, these listening comprehension results give a very strong support to parent particiaption as an aid to pupil learning.

On tests of the speaking skill, parent participation made very little difference. None of the F-ratios were significant; in fact, they were all less than 1.00. And, as would be expected from these results, the differences between means were quite small. The adjusted means, showing learning for each semester and the full year, are given in Table 34.

Table 32

ONE-DIMENSIONAL COVARIANCE ANALYSES OF THE SIXTH GRADE LISTENING COMPREHENSION TESTS PARENT PARTICIPATION VERSUS NO PARENT PARTICIPATION

First Semester Test				Second Semester Test			
Source of Variation	Residual Degrees of Freedom	Residual Sum of Squares	Residual Mean Square	Source of Variation	Residual Degrees of Freedom	Residual Sum of Squares	Residual Mean Square
Total	1,874	68,251.012		Total	1,873	52,843.630	
Within Groups	1,873	68,060.093	36.337	Within Groups	1,872	52,623.202	28.111
Between Groups	1	190.919	190.919	Between Groups	1	220.328	220.328

$F = \frac{190.919}{36.337} = 5.254$ $\quad$ $F = \frac{220.328}{28.111} = 7.838$

$P < .05$ $\quad$ $P < .01$

Table 33

ADJUSTED MEANS ON THE SIXTH GRADE LISTENING COMPREHENSION TESTS PARENT PARTICIPATION VERSUS NO PARENT PARTICIPATION

Test	Means: No Parent Participation	Means: Parent Participation
First Semester	31.879	32.572
Second Semester	32.257	33.011

Table 34

ADJUSTED MEANS ON THE SIXTH GRADE SPEAKING TESTS PARENT PARTICIPATION VERSUS NO PARENT PARTICIPATION

Semester Test	Means: No Parent Participation	Means: Parent Participation
First	15.722	15.874
Second -- Second Semester's Learning Reflected	22.278	22.027
Second -- Full Year's Learning Reflected	22.248	22.126

The activities suggested for participants in the parent-help method have been entirely audio-lingual in nature, that is, they have involved listening to and speaking Spanish but have not involved reading and writing. On the surface, it would seem that parent help should influence only the listening comprehension and speaking skills. However, if the prior conclusion that the method is partly effective because of increased motivation on the part of the child to learn Spanish is valid, then pupils with parent help should perform better than the others on reading and writing tests. Pupils with parent help did perform better than those without such help on each reading and writing test, though the differences were not statistically significant for either semester alone. Where full year learning was reflected, however, the F-ratio was 5.428, and for n_1 of 1 and n_2 of 1,490, this F-ratio has probability less than .05. The means for these analyses are shown in table 35.

Table 35

ADJUSTED MEANS ON THE
SIXTH GRADE READING AND WRITING TESTS
PARENT PARTICIPATION VERSUS NO PARENT PARTICIPATION

Semester Test	Means	
	No Parent Participation	Parent Participation
First	22.180	22.945
Second -- Second Semester's Learning Reflected	17.079	17.636
Second -- Full Year's Learning Reflected	16.967	18.024

These results on reading and writing appear to validate the hypothesis that at least part of the effectiveness of parent participation is motivational. Not only does the child perform better on tests of the understanding skill, he also demonstrates statistically significant superiority on reading and writing.

Overall, the sixth grade results constitute another strong endorsement of the parent-participant method. Two of the language skills, listening comprehension and reading and writing, are definitely improved through parent help, and on speaking, the third skill, pupils whose parents participated did at least as well as those whose parents were not involved.

4. Pupil and Teacher Interest

Language Skills as Dependent Variables. As discussed previously, a set of teacher and pupil interest scales was developed by Educational Testing Service especially for the project and was used at sixth grade during 1962-63. These scales were validated in terms of internal consistency only and not against any external criterion. Therefore, results derived from their use must be interpreted with some caution, though their usefulness is not necessarily impaired.

Assuming that the scales actually measured teacher and pupil interest in Spanish, the first question considered was, "What effect does teacher and pupil interest have on the amount pupils learn?" To answer this first question, the interest scale results were analyzed entirely as independent variables, with language skills as dependent variables. (First semester tests were used here because the interest scales were administered during the first semester.) Table 36 gives the results of two two-dimensional analyses in which teacher interest and pupil post interest were the independent variables. Listening comprehension is the dependent variable in one analysis, and reading and writing is dependent in the other.

The analyses show that both teacher interest and pupil interest produced significant differences on tests of the language skills and that there was no interaction. Furthermore, the larger effect was produced by pupil interest; the

F-ratios for this variable are on the order of 3 1/2 times larger than those for teacher interest. The adjusted means in table 37 were generally in the direction expected, that is, higher test means are related to higher interest.

Table 36

ANALYSES OF THE EFFECTS OF TEACHER AND PUPIL INTEREST ON SIXTH GRADE LANGUAGE SKILLS TESTS

Listening Comprehension Test

Source of Variation	Residual			F-ratio	Probability
	Degrees of Freedom	Sum of Squares	Mean Square		
Teacher Interest	2	343.459	171.730	4.694	< .01
Pupil Interest	2	1,044.801	522.401	14.277	< .001
Interaction	4	62.978	15.744	0.430	> .20
Within Groups	1,703	62,308.597	36.588		

Reading and Writing Test

Source of Variation	Residual			F-ratio	Probability
	Degrees of Freedom	Sum of Squares	Mean Square		
Teacher Interest	2	1,107.863	553.932	5.617	< .01
Pupil Interest	2	4,121.816	2,060.908	20.897	< .001
Interaction	4	202.430	50.608	0.513	> .20
Within Groups	1,703	167,950.138	98.620		

Table 37

ADJUSTED MEANS
ON THE LANGUAGE SKILLS TESTS
TEACHER INTEREST BY PUPIL INTEREST

Pupil Interest	Listening Comprehension Test				Reading and Writing Test			
	Teacher Interest				Teacher Interest			
	Low	Middle	High	Total	Low	Middle	High	Total
High	32.969	32.761	33.175	32.946	23.533	22.427	25.627	23.733
Middle	32.213	32.071	33.416	32.509	24.492	23.599	24.708	24.165
Low	30.754	30.360	31.567	30.816	20.904	19.607	21.051	20.376
Total	31.947	31.713	32.795	32.101	23.087	22.032	23.881	22.868

Since both teacher interest and pupil interest produce statistically significant differences in amount learned, it will be well to examine each effect in more detail. First, with regard to teacher interest, the question arises as to whether interest operates independently from experience and preparation. One would suspect that, in general, the teachers higher in experience and preparation would be more likely to be higher in interest. In this case, the interest scales could be merely remeasuring teacher experience and preparation (TEP). To determine the relationship, a two-way table, with interest by TEP, was set up for sixth grade teachers, and related chi square computed. The results are shown in table 38.

Table 38 indicates that, contrary to what might be logically expected, there was no correlation between teacher interest and teacher experience and preparation. The contingency coefficient for the X^2 in table 38 is .13.

Both teacher variables are important, therefore. Both have been shown to relate significantly to the amount pupils learn, and the results here show that they are independent. In this case, the best performance should be by pupils with teachers high in experience and proparation and also high in interest. This notion was tested through a two dimensional covariance analysis with TEP and interest as independent variables and the understanding and reading and writing skills as dependent variables. As in previous analyses, the independent variables produced statistically significant differences. Also significant, however, were the interactions. With listening comprehension as the dependent variable, the interaction F-ratio was 5.954, and with reading and writing as dependent, it was 2.334. The related probabilities, for n_1 of 4 and n_2 of 1.823, were, respectively, less than .001 and approximately .06.

Table 38

RELATIONSHIP BETWEEN TEACHER INTEREST
AND TEACHER EXPERIENCE AND PREPARATION

Teacher Interest	Teacher Experience and Preparation			Significance Test
	Low	Middle	High	
High	27.59%	23.88%	30.00%	
Middle	51.72	40.30	41.67	$X^2 = 2.734$
Low	20.69	35.82	28.33	$.50 < P < .70$
Total	100.00%	100.00%	100.00%	
(N)	(29)	(67)	(60)	

The best performances on both listening comprehension and reading and writing tests were, as hypothesized, by pupils with teachers high on each independent variable. To this extent, the results are not surprising. The interaction, however, came as a complete surprise, and the pattern associated with it suggests some revealing conclusions regarding the teacher variables.

The high teacher interest and high experience and preparation condition is clearly desirable. But what happens when teacher interest is low? In that situation, experience and preparation does not have the advantageous effects one would expect. Indeed, for the listening comprehension skill, experience and preparation is a detriment if interest is low! The poorest performance of all was by pupils of teachers high in experience and preparation but low in interest. One might conclude, on observing these results, that a teacher can be expert in not teaching, as well as the other way around.

Table 39

ADJUSTED MEANS
ON THE LANGUAGE SKILLS TESTS
TEACHER INTEREST BY EXPERIENCE AND PREPARATION

Teacher Interest	Listening Comprehension Test			Reading and Writing Test		
	TEP			TEP		
	Low	Middle	High	Low	Middle	High
High	31.725	32.243	33.586	21.237	22.398	23.967
Middle	30.610	32.564	31.187	21.390	22.713	21.335
Low	32.922	32.227	31.015	20.841	23.768	22.961

Which of the teacher variables under consideration is more important? Both have been shown to relate significantly to pupil learning. Furthermore, they have been found independent -- a teacher's experience and preparation has nothing to do with his interest. Yet they interact, so that high levels of both are needed. This being the case, it is difficult to say which is more important. The fact remains, however, that experience and preparation can be dealt with by a school system through careful recruitment, inservice training, and summer workshops, while interest would seem to be much more of an individual matter with less chance for outside control.

Pupil Interest as Dependent Variable. Tables 36 and 37 showed pupil interest to exert even more influence on learning than teacher interest. Therefore, pupil interest also merits close examination, though, within the scope of the Denver-Stanford project, little more can be done with it as an independent variable. More important in this context is to determine what will effect pupil interest, that is, to treat pupil interest as a dependent rather than an independent variable.

Accordingly, pupil interest (measured at the end of the first semester) was treated as a dependent variable in several analyses. In these, an attempt was made to determine the effect on pupil interest of the following factors: teacher interest, teacher experience and preparation, parent participation, experimental treatment, and pupil interest prior to beginning the sixth grade program (called "pupil pre-interest"). Significance tests, showing the influence of each of these on pupil interest, are given in table 40.

Table 40

INFLUENCE OF
SEVERAL FACTORS
ON PUPIL INTEREST

Effect	F-ratio	Degrees of Freedom		Probability
		n_1	n_2	
Teacher Interest	0.683	2	1,750	> .20
TEP	1.468	2	1,750	> .05
Parent Participation	1.614	1	1,829	> .05
Experimental Treatment	4.923	9	1,308	< .001
Pupil Pre-interest	162.485	3	1,702	< .001

Of the five factors, only experimental treatment and pupil pre-interest had statistically significant effects on pupil interest, and a comparison of F-ratios shows that the most influence by far was exerted by pupil pre-interest. In other words, a pupil's interest in Spanish after a semester's work was determined largely by what he thought of it before he began the semester. Adjusted means, with pupil interest categorized by pre-interest and teacher interest, are shown in table 41. The interaction for this analysis was not statistically significant.

Table 41

ADJUSTED
PUPIL INTEREST MEANS
PUPIL PRE-INTEREST BY TEACHER INTEREST

Pupil Pre-interest	Teacher Interest			
	Low	Middle	High	Total
High	14.013	14.331	14.860	14.415
High Middle	12.651	12.477	12.475	12.524
Low Middle	9.048	9.488	10.025	9.529
Low	6.590	7.829	7.450	7.369
Total	10.341	11.213	11.362	11.186

The great influence of pre-interest on pupil interest, and the much smaller influence of teacher interest, are clearly shown in table 41. The means in every category of teacher interest are ranked precisely by pupil pre-interest, while teacher interest has little effect anywhere.

These results have an obvious implication -- that what happens to a child before he starts sixth grade Spanish is vitally important in shaping his attitude toward the subject in sixth grade. Sixth grade, of course, is the second year of Spanish for the child, and it follows a full year of work with a fifth grade teacher. Further, it is the second year in which the child's parents will or will not have participated. So it is not surprising that his attitudes toward Spanish are pretty well set when he starts sixth grade.

While these results pinpoint the importance of the pupil's fifth grade experience, however, they do not relieve the sixth grade teacher of responsibility. This point is emphasized by table 40. Though the largest influence by far is pupil pre-interest, experimental treatment at sixth grade also produced differences significant beyond the .001 level. Table 42 gives adjusted means when pupil interest is categorized by teacher interest and by experimental treatment. The interaction for this breakdown was significant beyond the .05 level.

Table 42

ADJUSTED
PUPIL INTEREST MEANS
EXPERIMENTAL TREATMENT BY TEACHER INTEREST

Experimental Treatment	Teacher Interest			
	Low	Middle	High	Total
As	10.706	10.567	10.908	10.703
As (R)	10.340	9.807	10.761	10.217
Td	10.178	9.118	11.904	10.364
TdAs	9.504	10.288	9.078	9.884
- - - - -	- - - - -	- - - - -	- - - - -	- - - - -
TdAh	12.053	12.043	12.187	12.087
TdAsEh	11.372	13.862	9.875	12.106
TdAsC	11.700	12.588	11.353	11.932
TdAhC	11.905	11.581	11.344	11.607
EsAh	10.780	11.497	12.129	11.393
EsAh (R)	10.744	12.289	12.837	12.285

Most noticeable in table 42 is a clear division point, marked by the dashed line, between relatively low and relatively high interest. The means below this line are consistently higher than those above it. What separates those practices below the line from those above it? The answer seemed to be that those practices below the line involve a greater variety of activities. All practices above the line had all instruction in the classroom during the regular 30 minute period each Tuesday, Wednesday, and Thursday. All six practices below the line had some activity outside of this regualr period, and five of the six involve homework. The implication is clear: One way to increase a child's interest in Spanish at sixth grade is to add some outside activity, and homework appears to be as effective an additional activity as any.

In a final analysis, teacher interest was the dependent variable and regular versus special teacher was the independent variable. The reader should recall that "regular versus special" refers to the teacher of subjects other than Spanish. A "regular" teacher was one who had the pupils for Spanish as well as all other academic subjects, and a "special" teacher was one who taught them Spanish only. The F-ratio for this analysis was 6.119, which, with n_1 of 1 and n_2 of 175, is significant beyond the .02 level. The mean interest scores were 23.058 for special teachers and 21.316 for regular teacher; therefore, the special teachers showed significantly more interest in Spanish than did the regular teachers.

Insofar as teacher interest *per se* is concerned, the special teachers seem to have an advantage, and this apparently counterbalances other advantages which accrue to regular teachers since results at both fifth and sixth grade showed no significant difference in amounts learned by pupils with special teachers and those with regular teachers. These results are important in their implication to an elementary school Spanish program. At present, many of the regular classroom teachers are not prepared to teach Spanish so that a special teacher must be used. The results show that the special teachers do the job quite well and that a child taking Spanish from a special teacher is likely to learn as much as one with a regular teacher.

C. Summary

In summary, the sixth grade results confirmed the hypothesis that a combination of automated and teacher-directed instruction would be superior to either method alone. This combination produced significantly superior results on both the listening comprehension and reading and writing tests when both types of instruction were given in the classroom in a complimentary manner.

This combination produced somewhat less favorable results on speaking test, apparently because there were fewer chances to pratice speaking when automated instruction was used. However, it appears this deficiency can be partly overcome through use of electronic aids as an additional in-school activity which is scheduled outside of the regular Spanish instruction period. In this instance, the aids, together with additional reading material and cultural artifacts, were used as part of a Spanish corner.

Results derived from special teacher and pupil interest scales showed that these variables indeed affect the amount a pupil learns. Teacher experience and preparation also affects learning, but not always in direct fashion. Rather, teacher experience and preparation interacts with teacher interest so that larger amounts of experience and preparation are valuable only when interest is high.

Pupil interest related, as a dependent variable, to two factors. The stronger was pupil interest prior to the beginning of the school year, emphasizing the importance of the pupil's experience in fifth grade. The second factor was experimental treatment. Pupil interest was significantly higher under those conditions which provided some activity in addition to those of the regularly scheduled classroom period. Homework was one such additional activity.

Parent participation, for the second year, was a valuable addition to the sixth grade activities. In fact, the interaction between prior Spanish and parent participation was not found at sixth grade; the method was effective for all pupils.

Finally, pupils learned about the same amount whether they were taught by the regular classroom teacher or by a special teacher who handled only the Spanish instruction.

The following activities at sixth grade are therefore recommended: basic audio-lingual instruction by television, teacher-directed audio-lingual instruction by the eclectic method, reading and writing instruction in class by a combination of the teacher-directed and automated methods, a Spanish corner in school, parent help at home, some additional homework, and an on-going inservice teacher training program.

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APPENDIX A

Standard Deviations and Variances on Each Test
-- By Research Group

Fifth Grade

		Listening Comprehension		Speaking	
Research Group		**First Semester**	**Second Semester**	**First Semester**	**Second Semester**
No Electronic Aids	σ	9.042	8.177	2.460	4.544
	σ^2	81.758	66.863	6.052	20.648
Electronic Aids Without Feedback	σ	7.131	7.482	2.460	4.224
	σ^2	50.851	55.980	5.560	17.842
Electronic Aids With Feedback	σ	7.376	7.938	2.367	4.139
	σ^2	54.405	63.012	5.603	17.131
Total	σ	7.985	7.886	2.429	4.366
	σ^2	63.769	62.197	5.902	19.070

Sixth Grade

		Listening Comprehension		Reading and Writing		Speaking	
Research Group		**First Semester**	**Second Semester**	**First Semester**	**Second Semester**	**First Semester**	**Second Semester**
As	σ	6.819	7.021	10.612	10.417		
	σ^2	46.499	49.294	112.615	108.514		
As(R)	σ	8.606	8.577	13.307	12.030	5.485	6.306
	σ^2	74.063	73.565	177.076	144.721	30.085	39.766
EsAh	σ	7.464	7.441	10.490	12.181	4.954	8.325
	σ^2	55.711	55.368	110.040	148.377	24.542	69.306
EsAh(R)	σ	8.835	8.946	11.082	10.753	5.326	6.809
	σ^2	78.022	80.031	122.811	115.627	28.366	46.362
Td	σ	9.477	8.299	12.490	11.831		
	σ^2	89.814	68.873	156.000	139.973		
TdAs	σ	8.160	7.953	12.700	12.245		
	σ^2	66.586	63.250	161.290	149.940		
TdAh	σ	8.086	8.768	13.587	12.235	4.511	6.725
	σ^2	65.383	76.878	184.607	149.695	20.349	45.226
TdAsEh	σ	8.882	8.725	12.962	12.329	4.910	4.610
	σ^2	78.890	76.126	168.013	152.004	24.108	57.912
TdAsC	σ	7.355	7.587	11.819	11.847		
	σ^2	54.096	57.563	139.689	140.351		
TdAhC	σ	8.973	8.703	11.491	10.763		
	σ^2	80.515	75.742	132.043	115.842		
Total	σ	8.342	8.308	12.396	11.857	5.060	7.068
	σ^2	69.599	69.038	153.675	140.608	25.608	49.965

APPENDIX B

Distribution of Classes by Class Size

Fifth Grade

Number of Pupils	Number of Classes	Percent
0 - 19	3	1.6%
20 - 24	11	5.8
25 - 29	34	18.1
30 - 34	70	37.2
35 - 39	50	26.6
40 - 44	15	8.0
45 - 49	3	1.6
50 or more	2	1.1
Total	188	100.0%

Sixth Grade

Number of Pupils	Number of Classes	Percent
0 - 19	8	4.4%
20 - 24	14	7.8
25 - 29	49	27.2
30 - 34	58	32.2
35 - 39	37	20.6
40 - 44	9	5.0
45 - 49	3	1.7
50 or more	2	1.1
Total	180	100.0%